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(54) Threaded insert

(57) A threaded insert (1) for fastening a mounting member on a holding member has an outer thread (3) for screwing into the holding member (11) and an inner thread (8) for receiving of a screw (12) for holding the mounting member (13). The threaded insert (1) has four slots (6) extending axially from a front end of the insert, and the outer thread (3) has a tapering portion (3') in the region of the slot (6). The flange (4) may have an outer hexagonal form (5) for a tool; alternatively an inner hexagon or a cross recess may be provided in the flange.

FIG.1

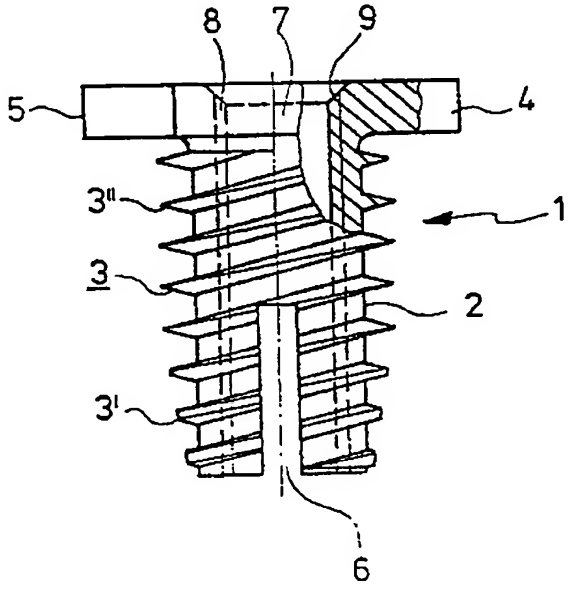

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FIG.1

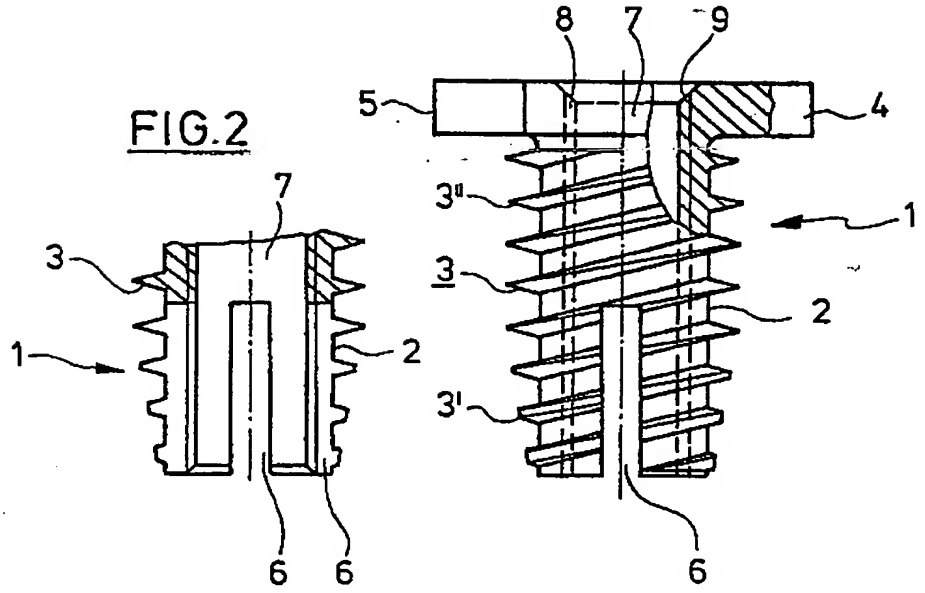


FIG.2

FIG.3

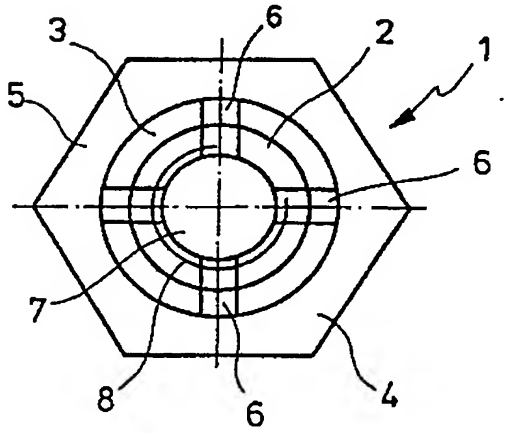


FIG.4

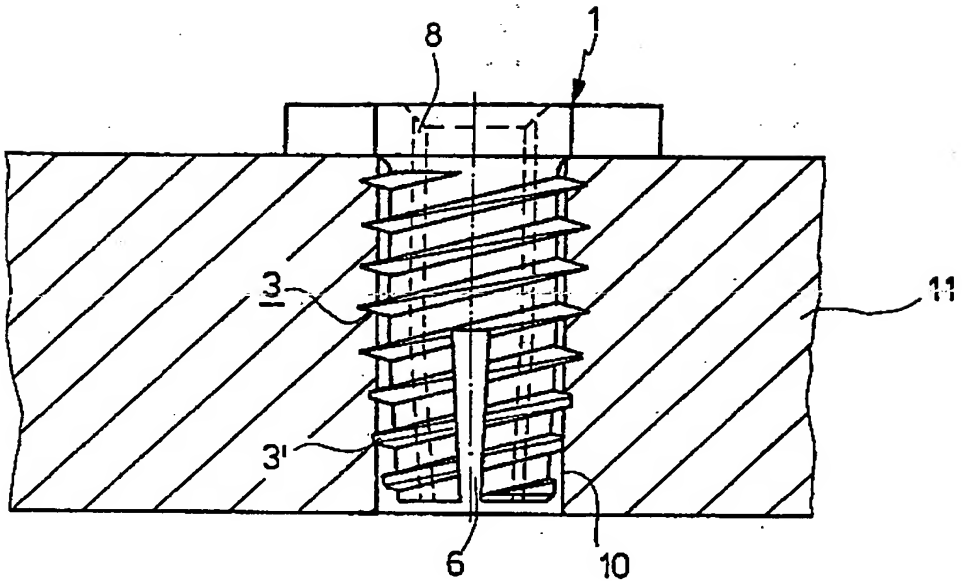
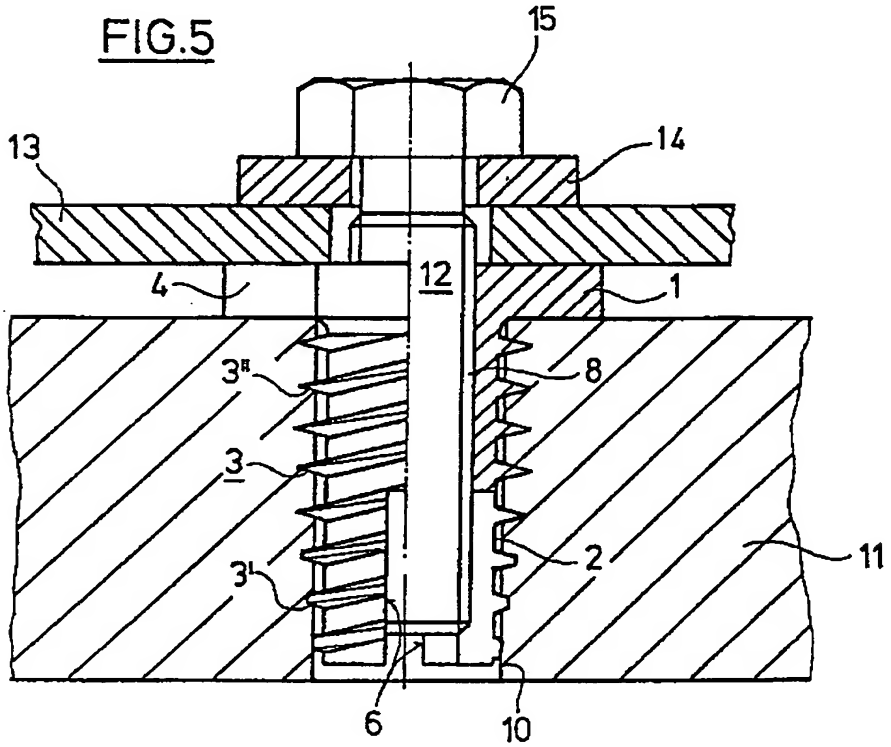


FIG.5



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Threaded insert

The invention resides in a threaded insert for fastening a mounting member to a holding member, said insert having an outer thread for screwing into the holding member and an inner thread for receiving a screw holding the mounting member.

In different fields of construction, for instance in the field of the construction of vehicles, it is customary to realize screw mounts by the use of a plurality of fastening members. For this, a threaded insert of the cited kind is screwed into a holding member. The threaded insert serves for the receipt of the screw which fastens a mounting member at the holding member or the threaded insert. Such screw mounts are especially used if a thread inserted into the holding member can be easily destroyed, as this is for instance the case with a holding member of aluminum. Then, it is necessary to turn the threaded insert only once with high precision while the screw can be released and also tightened many times without the necessity of special caution.

However, a durable protection of the screwing for avoiding an automatic release or a coturning effect of the threaded insert during the release of the screw can be only realized in a difficult manner. In many cases, protection of the thread formed by the insert is achieved by the application of an adhesive, for instance by micro-encapsulation. However, such measures of protection are expensive and suseptible to damage.

According to this invention a threaded insert for fastening a mounting member on a holding member, comprises an outer thread for screwing into the holding member and an inner thread for receiving a screw for holding the mounting member, in which the threaded insert has at least one slot extending from a front end of the insert in an axial direction, and in which the outer thread has a thread inlet in the range of the slot, the outer diameter of the thread

inlet increasing with increasing axial distance from the slotted front end.

An inventive threaded insert has a relative good radial deformability in its slot range. When the thread inlet is screwed in ,the insert is partly radially compressed in the slot range since, with increasing screw depth, an increasing outer diameter comes into engagement in the prepared bore of the holding member. At the same time the outer thread is pressed deeper and deeper into the material of the holding member with increasing distance from the slotted end. It is most favourable if the diameter of the bore or the outer diameter of an inner thread prepared therein substantially corresponds to the smallest diameter of the thread inlet. In any case, the diameter of the bore or the outer diameter of a prepared inner thread is not allowed to correspond to the maximum diameter of the thread inlet or to increase the same since in such a case no increasing radial deformation with increasing screwing depth is reached.

The total cross-section of the thread insert in the slot range and thus also the diameter of its inner thread lying therebelow is decreased by the radial compression. The size of the diameter reduction substantially depends on the materials of the threaded insert and of the holding member as well as on the dimensions of the threaded insert and of the bore or of a prepared inner thread in the holding member. A screw subsequently turned into the threaded insert enforces a radial spreading in the slot range of the threaded insert whereby the thread inlet is pressed into the surrounding material. By this not only a protection of the threaded insert in the holding member but also of the screw which is held without play in the threaded insert is realized. By the selection of suitable materials and a suitable dimensioning of the members the reaction forces responsible for the protection are not decreased so far that a reduction of the clamping forces below the necessary value results. Accordingly, the

inventive protection is durable and prevents in an effective manner an unavoided release of the screw mounting. Furthermore, the threaded insert has a self-cutting function on account of its thread inlet.

According to a preferred embodiment of the invention a plurality of slots, preferably four slots, are disposed around the periphery of the threaded insert in a equally spaced manner. By this feature a simple manufacture is assured with a sufficient radial deformability since opposing slots can be simultaneously incorporated.

According to another embodiment each slot axially extends about half of the length of the outer thread so that the screw which is turned in is tightly held in the inner thread when the spreading effect begins at the reaching of the slot range. Then, the inner thread and the screw thread of the screw are protected against destroying on account of increased turning-in moments during spreading. Furthermore, the outer thread can be used as supporting thread so that the threaded insert can transfer high mounting forces.

Preferably, the slot width corresponds to about a quarter of the core diameter of the outer thread.

According to a practical embodiment it is provided that the outer diameter of the thread inlet extends in the skirt surface of a cone whereby a slight slope of the spreading and protection forces is attained. If according to another embodiment the thread inlet is joined by an inner thread the outer diameter of which extends in the skirt surface of a cylinder, a maximum spreading and protection force is not exceeded and a high load capacity of the screw mounting is enabled.

According to a preferred embodiment it is provided that the threaded insert has a flange on the front face showing away from the thread inlet. Upon turning into the holding member the flange can be pressed against the outer surface of the holding member whereby it provides for additional protection by axially restraining the threaded

insert. Furthermore, a mounting member can be supported at the flange so that fastening forces are introduced into the holding member exclusively by means of the threaded insert.

Finally, according to a practical embodiment it is provided that the threaded insert has engaging surfaces for a turn-down tool, especially an outer hexagon or an inner hexagon or a cross recess, at one front face, preferably at a front face provided with a flange.

Further details and advantages of the subject of the invention result from the following specification of the corresponding drawings which show an inventive threaded insert and a screw mounting made by this. In the drawings

figure 1 shows a front view of a threaded insert, partly in cross-section;

figure 2 shows a longitudinal section of a thread portion of the same threaded insert;

figure 3 shows a view from below of the same threaded insert;

figure 4 shows a longitudinal section of the same threaded insert in a holding member;

figure 5 shows a longitudinal section of a screw mounting with the same threaded insert.

The sleeve-like threaded insert 1 shown in figures 1 to 3 has a cylindrical insert shaft 2 with an outer thread 3 of constant lead and of a constant flank angle. At one front face the insert shaft 2 has a flange 4 which is provided with an outer hexagon 5 for turning down the outer thread 3.

Four straight slots 6 emanate from another front face of the insert shaft 2. The slots are equally distributed about the periphery of the insert shaft 2 and extend in the axial direction thereof for about half of its length. The width of the slots 6 corresponds to approximately a quarter of the diameter of the insert shaft 2 which corresponds to the core diameter of the outer thread 3.

In the slot range the outer thread 3 has a thread inlet 3' the outer diameter of which increases with

increasing distance from the slotted front face. The thread inlet 3' has reached its maximum outer diameter at the inner end of the slots 6, and the thread 3 has a completely formed triangular profile. The outer diameter of the thread inlet 3' extends on a skirt surface of the cone so that the thread profile between the slotted front face and the inner end of the slot is flattened on the outside. A thread 3 is formed as supporting thread 3'' between the thread inlet 3' and the flange 4. The outer diameter of the supporting thread extends on a skirt surface of a cylinder.

Finally, the threaded insert has also a throughbore 7 with an inner thread 8. In the range of the flange 4 the bore 7 is provided with an inner chamfer 9 which is to facilitate the introduction of a screw. A corresponding inner chamfer is formed at the slotted front face of the threaded insert 1 on account of reasons of manufacturing.

As shown in figure 4, for realizing a screw mounting the threaded insert 1 is first of all screwed into a bore 10 of a holding member 11. Since the threaded insert 1 has a self-cutting function, beforehand no inner thread has been incorporated into the bore 10. Since the smallest outer diameter of the outer thread 3 approximately corresponds to the inner diameter of the bore prior to the insertion of the threaded insert 1 and since the largest outer diameter of the outer thread 3 significantly exceeds the inner diameter of the bore, during turning down the outer thread is engraved into the inner wall of the bore. On the other side, the threaded insert 1 is a little bit radially compressed in the range of the slots 6 by the reaction forces of the holding member 11. Consequently, the inner diameter of the inner thread 8 is reduced towards the slotted front faces.

Figure 5 shows that a screw 12 which has been finally screwed into the threaded insert 1 again presses apart the threaded insert due to its small compressibility in the range of the slot 6 so that the threaded insert takes its original shape. Consequently, the thread inlet 3' is

pressed deeper into the inner wall of the bore 10 and a significant clamping effect on the outer periphery of the threaded insert 1 is attained. However, the reaction forces of the holding member 11 are also transmitted through the wall of the insert shaft 2 to the screw 12 and also secure the same in the screwing connection.

An axial restraining of the threaded insert 1 and an additional protection is achieved by firmly screwing the flange 4 against an abutting surface of the holding member 11. The flange 4 forms a supporting surface for a mounting member 13 on the outside. On the other side, the mounting member is held by the head 15 of the screw 12 by means of a washer 14. Even high forces can be transmitted between the mounting member 13 and the holding member 11, especially since the threaded insert 1 has a high tightening strength due to the supporting thread 3'' deeply gripping into the holding member 11.

An inventive threaded insert can cooperate with any commercial machine screws. A preferred material for the threaded insert has the designation 9S Mn Pb 28K.

CLAIMS

1. A threaded insert for fastening a mounting member on a holding member, comprising an outer thread for screwing into the holding member and an inner thread for receiving a screw for holding the mounting member, in which the threaded insert has at least one slot extending from a front end of the insert in an axial direction, and in which the outer thread has a thread inlet in the range of the slot, the outer diameter of the thread inlet increasing with increasing axial distance from the slotted front end.

2. A threaded insert according to claim 1, in which a plurality of slots are equiangularly arranged around the periphery of the threaded insert.

3. A threaded insert according to claim 2, in which four slots are arranged around the periphery of the threaded insert.

4. A threaded insert according to any one of the preceding claims, in which the or each slot extends in the axial direction for about half of the length of the outer thread.

5. A threaded insert according to any one of the preceding claims, in which the width of the or each slot corresponds to about a quarter of the core diameter of the outer thread.

6. A threaded insert according to any one of the preceding claims, in which the outer diameter of the thread inlet is defined by a frusto-conical surface.

7. A threaded insert according to any one of the preceding claims, in which the thread inlet leads into a supporting thread the outer diameter of which defines a cylindrical surface.

8. A threaded insert according to one any of the preceding claims, in which the threaded insert has a flange at its end remote from the thread inlet.

9. A threaded insert according to any one of the preceding claims, in which the threaded insert has engaging surfaces for a driving tool.

10. A threaded insert according to claim 9, when dependent upon claim 8, in which the engaging surfaces are formed on the flange and have the form of an inner hexagon, an outer hexagon or a cross-shaped recess.

11. A threaded insert substantially as described with reference to the accompanying drawings.

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